

**Amendment and Response**

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Serial No.: 09/603.132

Confirmation No.: 3538

Filed: June 23, 2000

For: DEVICE STRUCTURES INCLUDING RUTHENIUM SILICIDE DIFFUSION BARRIER LAYERS**Amendments to the Claims**

This listing of claims replaces all prior versions, and listings, of claims in the above-identified application:

1-44. **Canceled.**

45. **(Previously Presented)** A semiconductor device structure, the structure comprising:  
a substrate assembly including a surface; and  
a chemical vapor codeposited diffusion barrier layer over at least a portion of the surface,  
wherein the diffusion barrier layer is formed of  $\text{RuSi}_x$ , where  $x$  is in the range of about 0.01 to about 10.

46. **(Previously Presented)** The structure of claim 45, wherein  $x$  is in the range of about 1 to about 3.

47. **(Previously Presented)** The structure of claim 46, wherein  $x$  is about 2.0.

48. **(Previously Presented)** The structure of claim 45, wherein the at least a portion of the surface is a silicon containing surface and further wherein the structure includes one or more additional conductive layers over the diffusion barrier layer formed of at least one of a metal and a conductive metal oxide.

49. **(Previously Presented)** The structure of claim 48, wherein the one or more conductive layers are formed from materials selected from the group of  $\text{RuO}_2$ ,  $\text{RhO}_2$ ,  $\text{MoO}_2$ ,  $\text{IrO}_2$ , Ru, Rh, Pd, Pt, and Ir.

50. **(Previously Presented)** A capacitor structure comprising:  
a first electrode;

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a high dielectric material on at least a portion of the first electrode; and  
a second electrode on the dielectric material, wherein at least one of the first and second electrode comprises a chemical vapor codeposited diffusion barrier layer formed of  $\text{RuSi}_x$ , where  $x$  is in the range of about 0.01 to about 10.

51. **(Previously Presented)** The structure of claim 50, wherein  $x$  is in the range of about 1 to about 3.

52. **(Previously Presented)** The structure of claim 50, wherein the first electrode comprises a diffusion barrier layer, wherein the diffusion barrier layer of the first electrode is formed on at least a portion of a silicon containing region, and further wherein the first electrode comprises one or more additional conductive layers formed over the diffusion barrier layer, the one or more additional conductive layers formed of at least one of a metal and a conductive metal oxide.

53. **(Previously Presented)** The structure of claim 52, wherein the one or more additional conductive layers are formed from materials selected from the group of  $\text{RuO}_2$ ,  $\text{RhO}_2$ ,  $\text{MoO}_2$ ,  $\text{IrO}_2$ , Ru, Pt, and Ir.

54. **(Previously Presented)** An integrated circuit structure comprising:  
a substrate assembly including at least one active device and a silicon containing region;  
and  
an interconnect formed relative to the at least one active device and the silicon containing region, the interconnect including a chemical vapor codeposited diffusion barrier layer on at least a portion of the silicon containing region, wherein the diffusion barrier layer is formed of  $\text{RuSi}_x$ , where  $x$  is in the range of about 0.01 to about 10.

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55. **(Previously Presented)** The structure of claim 54, wherein x is in the range of about 1 to about 3.

56. **(Previously Presented)** The structure of claim 54, further comprising a conductive contact material formed relative to the diffusion barrier layer.

57. **(Currently Amended)** A semiconductor device structure, the structure comprising:  
a substrate assembly including a surface defining an opening having an aspect ratio greater than about 1; and  
a chemical vapor codeposited diffusion barrier layer over at least a portion of the surface defining the opening, wherein the diffusion barrier layer is formed of  $\text{RuSi}_x$ , where x is in the range of about 0.01 to about 10.

58. **(Previously Presented)** The structure of claim 57, wherein the diffusion barrier layer comprises a conformal layer within the opening.

59. **(Previously Presented)** The structure of claim 57, wherein the diffusion barrier layer comprises a conformal layer of uniform thickness within the opening.

60. **(Currently Amended)** The structure of claim 57, wherein the opening has an aspect ratio greater than about 3 [[1]].

61. **(Previously Presented)** The structure of claim 60, wherein the diffusion barrier layer comprises a conformal layer within the opening.

62. **(Previously Presented)** The structure of claim 60, wherein the diffusion barrier layer comprises a conformal layer of uniform thickness within the opening.

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63. **(Currently Amended)** A capacitor structure comprising:  
a first electrode;  
a high dielectric material on at least a portion of the first electrode; and  
a second electrode on the dielectric material, wherein at least one of the first and second electrodes has a surface defining an opening having an aspect ratio greater than about 1, wherein a chemical vapor codeposited diffusion barrier layer is over at least a portion of the surface defining the opening, and wherein the diffusion barrier layer is formed of  $\text{RuSi}_x$ , where x is in the range of about 0.01 to about 10.
64. **(Previously Presented)** The capacitor structure of claim 63, wherein the diffusion barrier layer comprises a conformal layer within the opening.
65. **(Previously Presented)** The capacitor structure of claim 63, wherein the diffusion barrier layer comprises a conformal layer of uniform thickness within the opening.
66. **(Currently Amended)** The capacitor structure of claim 63, wherein the opening has an aspect ratio greater than about 3 ~~[[1]]~~.
67. **(Previously Presented)** The capacitor structure of claim 66, wherein the diffusion barrier layer comprises a conformal layer within the opening.
68. **(Previously Presented)** The capacitor structure of claim 66, wherein the diffusion barrier layer comprises a conformal layer of uniform thickness within the opening.
69. **(New)** A semiconductor device structure, the structure comprising:  
a substrate assembly including a surface defining an opening, with the proviso that the surface defining the opening is not a silicon containing surface; and

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a chemical vapor codeposited diffusion barrier layer over at least a portion of the surface defining the opening, wherein the diffusion barrier layer is formed of  $\text{RuSi}_x$ , where  $x$  is in the range of about 0.01 to about 10.

70. (New) The structure of claim 69, wherein the diffusion barrier layer comprises a conformal layer within the opening.
71. (New) The structure of claim 69, wherein the diffusion barrier layer comprises a conformal layer of uniform thickness within the opening.
72. (New) The structure of claim 69, wherein the opening has an aspect ratio greater than about 1.
73. (New) The structure of claim 72, wherein the diffusion barrier layer comprises a conformal layer within the opening.
74. (New) The structure of claim 72, wherein the diffusion barrier layer comprises a conformal layer of uniform thickness within the opening.